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Before the Federal Communications Commission
Washington, D.C. 20554

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Federal Communications Commission
Office of the Secretary

92-125

In the Matter Of

Amendment of the Aviation Services Rules	)	RM 7611
(Part 87) to authorize use of the frequency	)	
406 MHz for Emergency Locator Transmitters (ELTs)	)	

COMMENTS OF
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

National Aeronautics and Space Administration (NASA) hereby submits its comments in response to the Commission's Notice of Proposed Rule Making released herein on June 5, 1992, stating as follows:

I. Background and Statement of Interest

The Commission proposes to allocate the frequency 406 MHz for Emergency Locator Transmitters (ELTs) consistent with the existing worldwide allocation to operate in conjunction with the COSPAS-SARSAT satellite system, in response to a NOAA petition. NASA, the developer of the SARSAT system and the technical advisor to the other governmental agencies involved in its implementation, strongly supports the proposal, and urges its prompt adoption.

The NASA response addresses the specific questions raised by the FCC in the subject Notice of Public Rulemaking (NPRM) and makes the following recommendations: NASA highly recommends that a 121.5 MHz homing signal be required with the 406 MHz ELTs; that the COSPAS-SARSAT requirements for certification by an approved COSPAS-SARSAT test facility be incorporated in the final FCC rules, and; that mandatory registration be included in the final rules.

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II. NASA's Response on Questions Raised in the Subject NPRM

With respect to the specific questions raised in the Commission's Notice, NASA urges the following:

(1) 121.5 MHz Homing Signal The 121.5 MHz homing signal is considered a mandatory requirement for the 406 MHz ELTs because it enables rescue personnel to pinpoint the distress transmission for search and rescue (SAR) operations. Although the accuracy of location of the 406 MHz satellite system (approx. 2 km) is 10 times better than the 121.5 MHz system, the final phase of the rescue operations requires location to within a few meters to affect the rescue. Federal, State, Local and Volunteer SAR forces are currently equipped with 121.5 MHz homing equipment in search aircraft or in hand held equipment used in ground searches (when weather and terrain do not permit air search).

In addition, many airport facilities have hand-held portable 121.5 MHz homing equipment used to pinpoint the location of either a false alarm on the airport or an accident within the vicinity of the airport. Without a homing capability these airport operations would not be possible.

Given that homing is required to locate the source of either a distress signal or a false alarm, the only alternative would be homing on the 406 MHz signal. If this alternative were chosen the result would be to require all SAR forces and airport facilities to add 406 MHz homing equipment. This would be a drastic measure which would not only delay the implementation of the 406 MHz ELTs, but would also result in a substantial cost impact to federal, state and local SAR resources. Volunteer forces would probably require years to implement the 406 MHz capability or would have to be funded by federal or state agencies.

(2) Additional International Requirements not in RTCA Standard NASA is not aware of any international requirements that are not contained in the Radio Technical Commission for Aeronautics (RTCA) Standard except for the certification discussed in paragraph II(3) below. As in the case of the 121.5 MHz ELTs, international agreements generally specify the radiated signal characteristics only, with national standards determining the survival and operational requirements. The

COSPAS-SARSAT Council (CSC) has specified the requirements[1] necessary to operate with the satellite system and these requirements have already been reflected in a CCIR standard for international use.

(3) Requirement for Independent Laboratory Certification To ensure compatibility with the COSPAS-SARSAT satellite system, to meet US commitments in the COSPAS-SARSAT Intergovernmental Agreement, and to ensure that SAR requirements are met, it is essential that the FCC rulemaking require 406 MHz radiobeacons sold for use in the US be certified by an approved COSPAS-SARSAT test facility.

The US has entered into an Intergovernmental Agreement which pledges the US to abide by the technical standards adopted by the COSPAS-SARSAT Council (CSC). These standards[2] require certification of beacons by an approved COSPAS-SARSAT test facility to ensure compatibility of the beacons with the satellite system and to protect the integrity of the 406 MHz SAR system.

Two important aspects of beacon performance that are ensured by laboratory certification are frequency stability and signal coding. If non-certified beacons were put into use that did not meet the frequency stability specification, very misleading locations could be supplied to the search forces. If the coding is improper, it may result in no detection by the satellite system or in incorrect information going to the search forces. Other portions of the certification are required to protect the satellite system from unintentional jamming.

(4) Effectiveness of Voluntary Registration The SAR effectiveness of the 406 MHz ELT is directly related to the availability of information on the identity of the ELT and the use of telephone points of contact to verify the distress and gain information on the estimated location of the aircraft in distress. Mandatory beacon registration is essential for realizing the full benefit from the 406 MHz satellite system, but based upon NOAA EPIRB experience, only about 50% of users can be expected to register voluntarily.

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[1] COSPAS-SARSAT Document C/S T.001 Specification for C-S 406 MHz Distress Beacons

[2] COSPAS-SARSAT Document C/S T.007 C-S 406 MHz Distress Beacon Type Approval Standard

The identification information provided in beacon registration allows SAR forces to effectively dispose of non-distress beacon activations without expending resources, and to more efficiently prosecute real distress incidents. It is also an obvious deterrent to using distress beacons in an unlawful manner.

Activation of a non-registered beacon in a non-distress situation invokes the same reaction from SAR forces as that intended for real distresses. Armed with registration information, however, SAR authorities have the opportunity to evaluate the situation by telephone and hold off further action if the activation proves to be false. Equipment and personnel that otherwise would be occupied in searching for the beacon are saved for real alerts.

The registration data, along with that available from the emergency contact, enables the SAR forces reacting to a real distress to be prepared for what they will find at the scene and to carry out the mission efficiently.

A 406 MHz detection capability from geostationary orbit has been demonstrated by NASA and is in limited operational use today. NOAA is implementing this capability on the next generation of geostationary environmental satellites to be launched starting in 1994. Geostationary alerts can be received immediately upon activation of a beacon, but unlike the low orbit COSPAS-SARSAT system, the geostationary satellite system cannot provide locations. When registration information is available from a geostationary alert, it will often be possible to determine quickly the approximate location of the distress, thus enabling SAR forces in the correct region to prepare for a mission without delay. Without registration information, on the other hand, no time advantage can be gained from the geostationary alert.

III. Additional Discussion Supporting the Adoption of 406 MHz ELTs

(1) The experience of the US Coast Guard in the maritime area with 406 MHz EPIRBs has demonstrated the effectiveness of the 406 MHz EPIRB as a lifesaving tool, while at the same time the 406 MHz system has shown its advantages in mitigating false alarms. When the EPIRB is not registered in the NOAA data base the Coast Guard has launched a mission 80% of the time to resolve the false alarm

whereas 82% of the 406 MHz false alarms are being handled without launching a rescue mission when the EPIRB is registered in the data base.[3]

(2) The use of a unique digital code in the beacon transmission has been demonstrated to eliminate the "false alerts"[4] generated on the 121.5 MHz frequency by noise and other sources of interference. Approximately 400 "false alerts" are generated each day from the 121.5/243 MHz satellite system. The 406 MHz satellite system will not recognize or generate a distress location unless the correct code is contained in the transmission.

(3) The improved location accuracy of the 406 MHz system coupled with the advantages of the identification code are expected to significantly reduce the time to rescue by allowing an earlier decision to launch the rescue and by reducing the time in the search area necessary to pinpoint the location of the distress. An estimate of the time to be saved by these features is in the order of 6 hours.

(4) The 406 MHz ELTs are not expected to produce the extensive false alarm problems currently being experienced at 121.5 MHz because of the incorporation of specifications in the RTCA Standard to reduce these problems. The applicable features of the latest RTCA standard (e.g.. improved g-switch and mounting guidelines as well as monitoring provisions) should minimize the false alarm problems with the 406 MHz ELTs. Additionally, the aircraft owners and operators should exhibit more caution with the 406 MHz beacons because the ELT's identification will be included in each transmission allowing the capability for the FCC to impose fines for deliberate misuse of the emergency beacon.

(5) The satellite detection and location of the existing 121.5 MHz radiobeacons suffers from a number of problems associated with the fact that these devices were not designed for satellite detection and location. These problems are: (1) The lack of identification, (2) The generation of spurious alerts, (3) Location ambiguity on the first satellite pass and (4) Noise and interference.

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[3] Data obtained from the US Mission Control Center and the US Coast Guard

[4] A "false alert" is a location generated by the COSPAS-SARSAT system from other than distress transmitters. They are generated by other RF signals in the band or from noise. "False alarms" are signals from ELTs or EPIRBs that are generated in non-distress situations such as mishandling of the beacon.

The inclusion of identification information in the signal, a higher power transmission and the frequency stability requirements of the 406 MHz ELT provides the following performance improvements addressing most of the above problems:

- elimination of "false alerts"
- improvement in first pass ambiguity resolution
- improved capability to verify an alert before committing resources
- complete elimination of present confusion with 121.5 MHz radiobeacons when multiple alerts occur in close proximity of each other
- global coverage through the use of the stored data mode
- ability to detect the distress in real time through use of the 406 MHz geostationary capability
- improvement in detection probability due to higher radiated power
- significant improvement in location accuracy (2 km vs. 20 km)
- approximately 10 fold increase in capacity

IV. NASA Recommendations

NASA recommends the following:

1. FCC take expedited action to allow carriage of 406 MHz Emergency Locator Transmitters (ELTs) by the US aviation community.

2. The 406 MHz ELT must include a 121.5 MHz homing signal to allow pinpointing the location of the distress and accomplishment of the final phase of the rescue operations.

3. The FCC rulemaking action should include provisions requiring certification by an approved COSPAS-SARSAT test facility.

4. The FCC should implement mandatory registration to improve life saving efforts and to save SAR resources in both distress and non-distress situations.

Respectfully submitted,
National Aeronautics and Space Administration

by _____ 7/23/92
Dr Lennard A. Fisk Date
Associate Administrator for
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Charles T. Force Date
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